JM3-BHT31
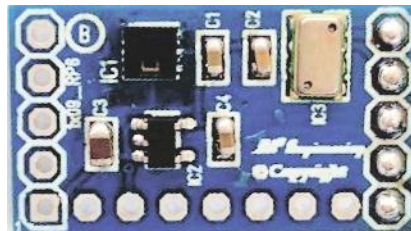
RP6 or ASURO
Barometer, Hygrometer & Temp. Module

RP6 or ASURO Barometer, Hygrometer & Temp. Module
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Information about limited warranty and responsibility

The warranty granted by AREXX Engineering is limited to the replacement or repair of the Module and its accessories within the legal warranty period if the default has arisen from production errors such as mechanical damage or missing or wrong assembly of electronic components except for all components that are connected via plugs/sockets.
The warranty does not apply directly or indirectly to damages due to the use of the robot. This excludes claims that fall under the legal prescription of product responsibility.

The warranty does not apply in case of irreversible changes (such as soldering of other components, drilling of holes, etc.) of the module or its accessories or if the module is damaged due to the disrespect of this manual!

It cannot be guaranteed that the supplied software will satisfy individual expectations or will run completely error-free and without any interruption. Moreover the software can be freely changed and is loaded into the unit by the user. Therefore the user carries the full risk regarding the quality and performance of the unit including all software.
AREXX Engineering guarantees the functionality of the supplied application examples provided the respect of the conditions specified in the data sheet. If the SAM-04-LAN or the PC software turns out to be faulty or insufficient, the customer carries all costs for service, repair or correction.
Please note the relevant license agreements on the CD-ROM!

Symbols

The manual uses following symbols:

The exclamation mark attracts the attention of the user to important instructions that must be adhered to. If you make a mistake in this part, it can lead eventually to the destruction of the robot or its accessories and even endanger your health or that of your environment!

The "Information" symbol draws the attention to useful tips and tricks or background information. It is not always essential to understand everything but it is often very useful.

Safety recommendations

IMPORTANT:

Prior to using this robot arm for the first time, please read this manual thoroughly up to the end! They explain the correct use and inform you about potential dangers! Moreover they contain important information that might not be obvious for all users.

- Check the polarity of the batteries or power supply.

- Keep all products dry, when the product gets wet remove the power directly.

- Remove the batteries or power when you are not using the product for a longer period.

- Before taking the module into operation, always check it and its cables for damage.

- If you have reason to believe that the device can no longer be operated safely,

  disconnect it immediately and make sure it is not unintentionally operated.

- Do not operate the module in rooms or under unfavourable conditions.

- This module is equipped with highly sensitive components. Electronic components are very sensitive to static electricity discharge. Only touch the module by the edges and avoid direct contact with the components on the circuit board.

Normal use

This module is developed to use with robots, which allows you to determine basic behaviour patterns and reactions of the robot to external influences yourself.

The module was developed as an experimental platform for all electronic technicians with interest in robotics. In practical tests, it visualises the influence and effects of software parameters as well as physical parameters via the corresponding sensor technology. Any use other than that described above is not permitted.

The product is not a toy and should be kept out of reach of children under 14 years of age! It may only be used in closed, dry indoor rooms. The product must not get damp or wet. Use other than that described above can lead to damage to the product and may involve additional risks such as short circuits, fire, electrical shocks etc.

Content

ASURO Robot
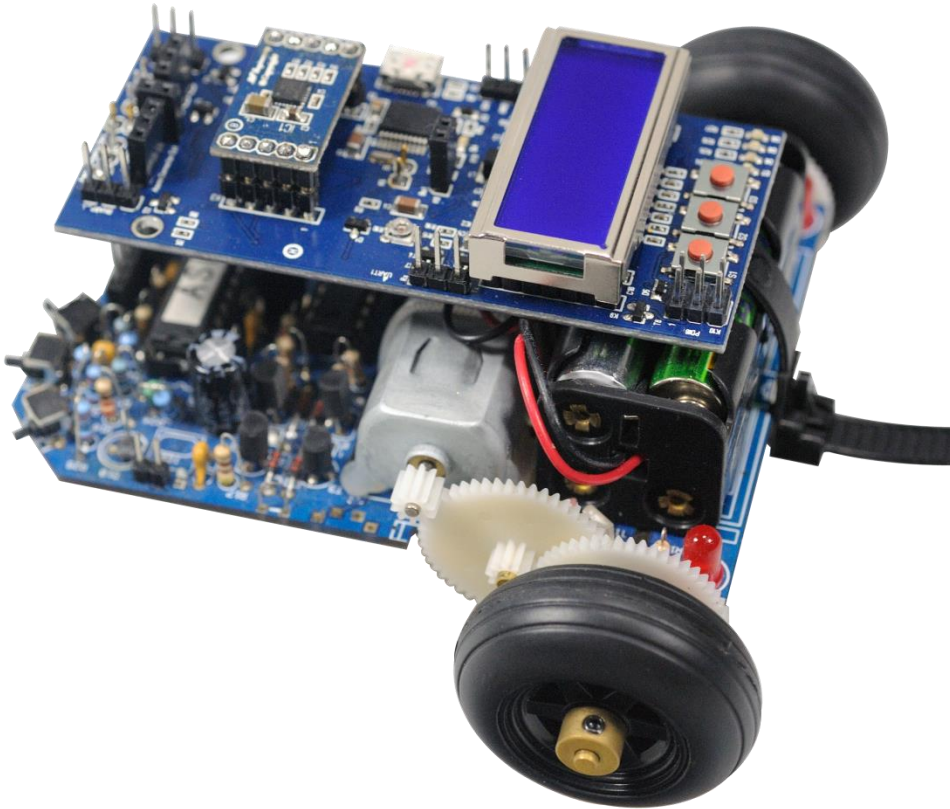
Asuro xTend and Compass- / Gyro Module and Display

Introduction

A general purpose barometer, hygrometer and temperature sensor module. It can be directly plugged into the ASURO expansion port on the ASURO xTend board - it can be stacked up with the ASURO Compass / Gyro Module and or RTC.

The sensor module is using the MS5607-02BA high resolution altimeter and the HTU21D sensor from MEAS Switzerland with I2C bus interface. This barometric pressure sensor is optimized for altimeters and variometers with an altitude resolution of 20 cm and can be used for weather station information as well. In addition, the relative humidity and temperature sensor are dedicated plug and play transducers for applications where reliable and accurate measurements are needed.

The barometric sensor module includes a high linearity pressure sensor and an ultra-low power 24 bit $\Delta\Sigma$ ADC with factory calibrated coefficients.
It provides a precise digital 24 bit pressure and temperature value and different operation modes that allow the user to optimize for conversion speed and current consumption. A high resolution temperature output allows the implementation of an altimeter/thermometer function without any additional sensor. The MS5607-02BA can be interfaced to virtually any micro controller. The communication protocol is simple, without the need of programming internal registers in the device. The sensing principle used leads to very low hysteresis and high stability of both pressure and temperature signal.

The humidity sensor setting new standards in terms of size and intelligence and provides calibrated, linearized signals in digital, I²C format. Every sensor element is factory calibrated and tested. Low battery can be detected and a checksum improves communication reliability. The resolution can be changed by command (8/12bit up to 12/14bit for RH/T).

Manual

1. Connecting to RP6 or ASURO xTend Board

The module will be simply plugged in to the K3 connector on the ASURO xTend board. There is a voltage regulator on the module so it can be directly plugged into the I2C Module header on the RP6 Sensor board. In the RP6 case, you have to solder contacts on the boards (Precision Contacts RM 2,54 Conrad Part number 741333 – 05).

1.1. PIN OUT Barometer Humidity Temp Module (Asuro Connector)

PIN 1	=	VDD_3.3	PIN 6	=	n/c
PIN 2	=	n/c	PIN 7	=	SCA
PIN 3	=	n/c	PIN 8	=	SCL
PIN 4	=	n/c	PIN 9	=	n/c
PIN 5	=	n/c	PIN 10	=	GND

PIN1   Pin10
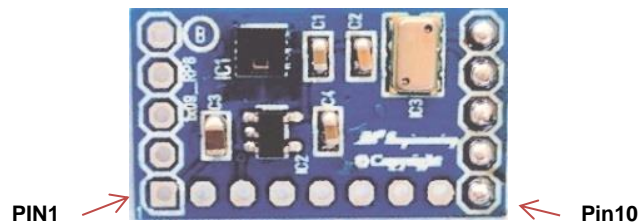
1.2. PIN OUT Barometer Humidity Temp Module (RP6 Connector)

PIN 1	=	VDD_3.3	PIN 6	=	n/c
PIN 2	=	SCL	PIN 7	=	n/c
PIN 3	=	SCA	PIN 8	=	n/c
PIN 4	=	n/c	PIN 9	=	GND
PIN 5	=	n/c			

PIN1   PIN2   Pin9
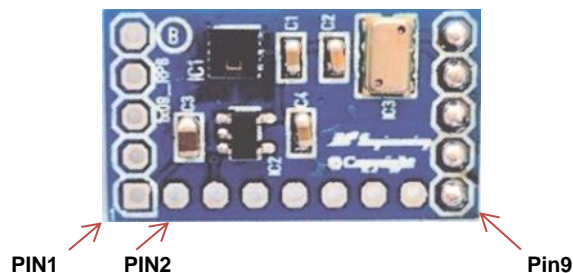
2. Software

The data access works over I2C Bus. There is no special initialization required – refer to datasheet of the MS5607-02BA and HTU21D for more information. A demo software is available for the ASURO xTend board with the attached Barometer Module.

2.1. Reading data from I2C

Principle way of reading data from the module

```
/************************************************************************\
 * read sensor data (generalized description)
\************************************************************************/

master.ReadRegisters(I2C Addr, Register | AUTO_INC, mBuffer, 6);
```

2.2. Writing data via I2C

Principle way writing data via I2C to the module

```
/************************************************************************\
 * write data to register (generalized description)
\************************************************************************/

master.TransmitBytes(I2C Addr, Register | AUTO_INC, data0, data1, data2);
```

2.3. Demo Software

The demo software for the ASURO xTend board is available which displays the pressure, relative humidity and temperature on the display.
To enable the display function you have to make a change the *Makefile* - in the Global Defines section you should have IOEXT_WEATHER defined.

```
# Global Defines
#
# Enable demo program for connected sensor module.
DEFINES =  IOEXT_WEATHER
```

2.4. Slave Addresses

```
BAROTEMP  = 0xEE              // MS5607-02BA03  Baro & Temp
RELHUM    = 0x80              // HTU21D   Relative Humidity & Temp
```

3. Commands / Register

3.1. MS5607-02BA03

Read Command	Hex Code
Reset	0x1E
Convert D1 (OSR=256)	0x40
Convert D1 (OSR=512)	0x42
Convert D1 (OSR=1024)	0x44
Convert D1 (OSR=2048)	0x46
Convert D1 (OSR=4096)	0x48
Convert D2 (OSR=256)	0x50
Convert D2 (OSR=512)	0x52
Convert D2 (OSR=1024)	0x54
Convert D2 (OSR=2048)	0x56
Convert D2 (OSR=4096)	0x58
ADC Read	0x00
PROM Read	0xA0 to 0xAE

Since there are no register on the barometer chip you have to follow the given procedure to read data after power up:

1. Issue Reset

2. Read PROM (128 bit of calibration words)

3. Initiate pressure (D1) conversion followed by Read ADC result (24 bit)

4. Initiate temperature (D2) conversion followed by Read ADC result (24 bit)

For detailed description of the commands and data processing refer to the datasheet.

3.2. HTU21D

Read Commands	Hex Code	Comment
Trigger Temperature Measurement	0xE3	Hold master
Trigger Humidity Measurement	0xE5	Hold master
Trigger Temperature Measurement	0xF3	No Hold master
Trigger Humidity Measurement	0xF5	No Hold master
Write user register	0xE6	
Read user register	0xE7	
Soft Reset	0xFE	

User Register	Bit	# Bits	default
Measurement Resolution Bit 7 Bit 0 RH Temp 0 0 12 bits 14 bits 0 1 8 bits 12 bits 1 0 10 bits 13 bits 1 1 11 bits 11 bits	7,0	2	'00'
Status End of Battery '0': VDD>2.25V '1': VDD<2.25V	6	1	'0'
Reserved – do not modify	3,4,5	3	'0'
Enable on-chip heater	2	1	'0'
Disable OTP reload	1	1	

For more details of the chip functionality please refer to the datasheet.

4. Technical Data

VDD   =   3.3 V +/- 5%

IDD   ≤   1.5 mA (peak)

                   ≤   0.2 µA   (standby)

Temperature Range: -10 to 65 °C

Key features:
- High resolution module
    - Altitude: 20cm
    - Humidity: 0,04%
- Fast conversion
- Integrated digital pressure sensor (24 bit ΔΣ ADC)
- Operating range: 10 to 1200 mbar
- Excellent long term stability
- Instantaneous desaturation after long periods in saturation phase
- Factory calibrated

5. Schematic

6. PCB

Top view: